INSTRUCTION BOOK

for

LOOP ANTENNA

ARC TYPE L-10A

(ANTENNA AT-382/ARC)

AIRCRAFT RADIO CORPORATION
BOONTON, NEW JERSEY

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ARCIB-L10A-1

April 1956

AIRCRAFT RADIO CORPORATION BOONTON, NEW JERSEY

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ARC Form No. 1427B
Printed in USA

May 20, 1955

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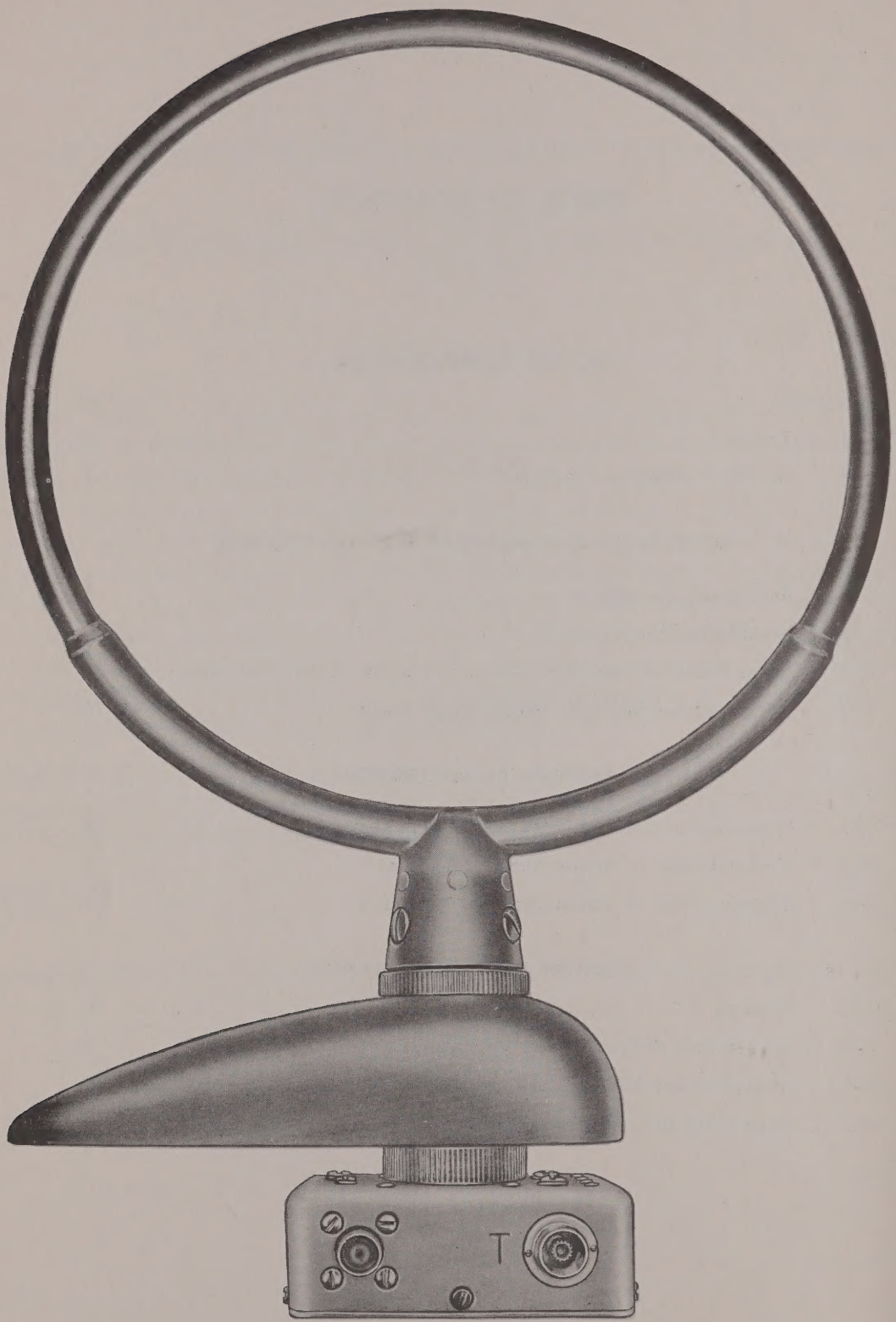


Figure 1–1. Loop Antenna ARC Type L-10A

SECTION I

DESCRIPTION

1–1. GENERAL.

1–2. Loop Antenna ARC Type L-10A (AN. nomenclature: Antenna AT-382/ARC), shown in figure 1–1, is a 9-inch diameter, electrostatically-shielded, rotatable, loop antenna designed to receive low-frequency signals for the purpose of direction-finding or homing. The L-10A is designed for remote control only, through the use of Control Unit ARC Type C-18 (AN. nomenclature: Antenna Control C-1113/ARC), or similar component. This control unit may be located as much as 20 feet away from the L-10A. It provides for manual control of the L-10A through a 360-degree rotation. Ease of rotation of the loop antenna is effected through the use of ball bearings and a high-ratio worm-gear drive. The L-10A has an inductance of 18 microhenries, a distributed capacitance of 67 micromicrofarads, and a Q of 46 at 400 kc. The L-10A is satisfactory for operation on aircraft with speeds up to 200 mph. To insure minimum r-f noise, the connection from the antenna loop to the coaxial connector on the base is taken from a multiple-point contact against a gold-plated gear. The use of an L-10A, with a receiver such as ARC's broadcast receiver, Type R-10A, or its range receiver, Type R-11A, provides a sharp aural-null signal on either broadcast or range signals.

Note

Loop Antenna ARC Type L-10A supersedes Loop Antenna ARC Type L-10. The two components are functionally interchangeable. In the L-10A, the slip ring arrangement has been modified to reduce static during rotation, and the base assembly has been altered.

1–3. AUXILIARY EQUIPMENT REQUIRED.

1–4. Loop Antenna ARC Type L-10A is designed for use with radio receivers, such as Receiver ARC Type R-10A or Receiver ARC Type R-11A. For control and operation of the L-10A, Control Unit ARC Type C-18 (see figure 1–2), or equivalent, with Mounting ARC Type M-18, and a length of Mechanical Linkage ARC-16158 are required. The r-f transmission line for the L-10A should consist of a suitable length of ARC-11318 (RG-58/U) cable terminated at each end with an ARC-11337 (UG-88/U) connector.

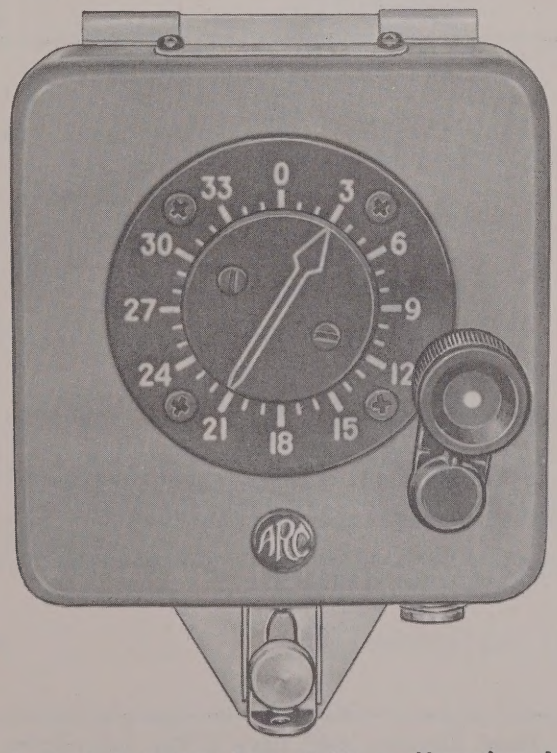
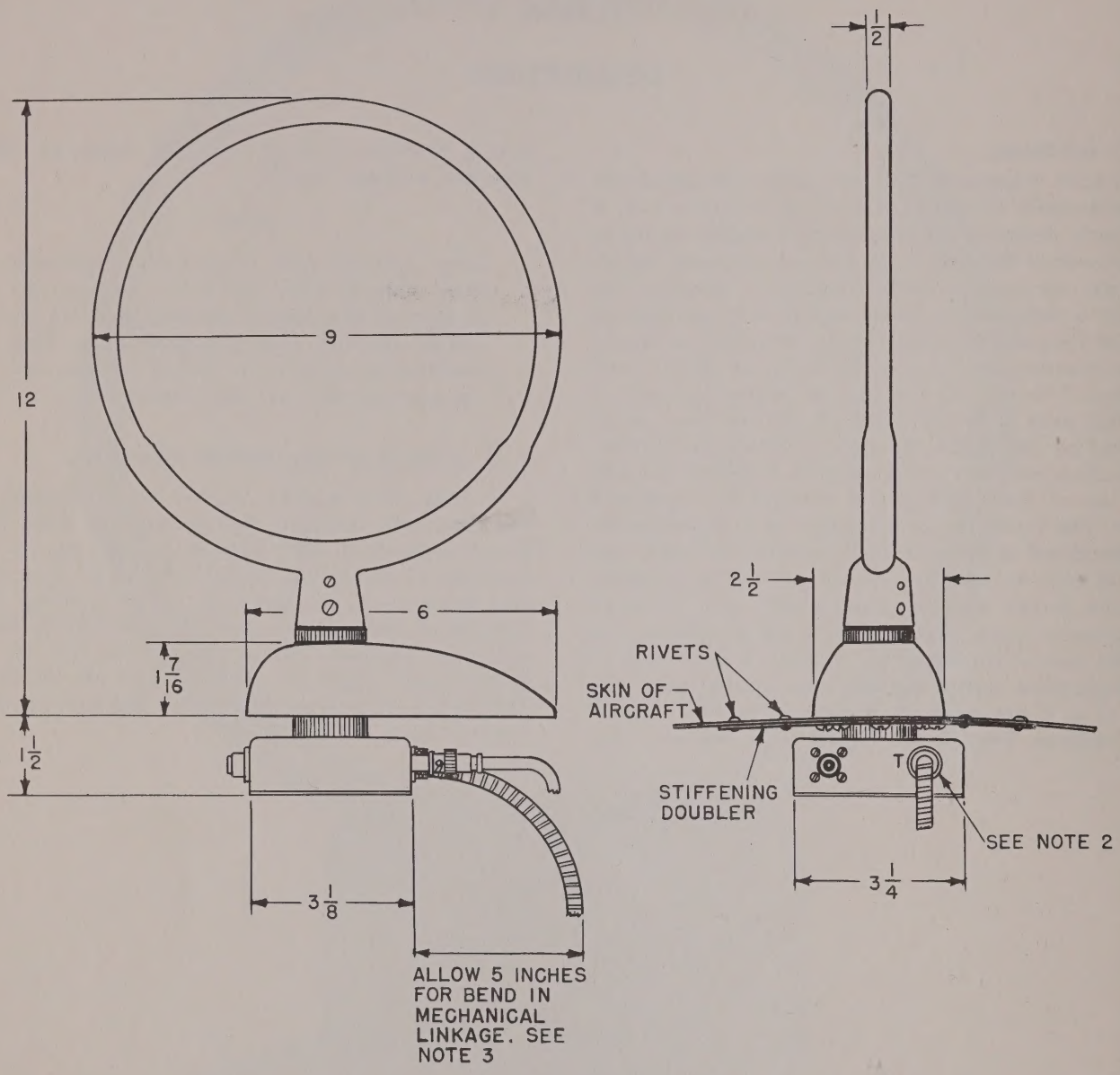


Figure 1–2. Control Unit ARC Type C-18 on Mounting ARC Type M-18



NOTES:

1. ALL DIMENSIONS IN INCHES.
2. FOR TOP-OF-AIRCRAFT MOUNTING, CONNECT MECHANICAL LINKAGE TO "T" CONNECTION AS SHOWN. FOR BOTTOM-OF-AIRCRAFT MOUNTING, CONNECT MECHANICAL LINKAGE TO "B" CONNECTION ON OPPOSITE SIDE OF GEAR BOX.
3. USE RIGHT-ANGLE COUPLING ARC-6357 IF MINIMUM-RADIUS AREA OF 5 INCHES IS NOT AVAILABLE.

Figure 2–1. Loop Antenna ARC Type L-10A, Installation Dimensions

SECTION II

INSTALLATION AND ADJUSTMENTS

2–1. INSTALLATION CONSIDERATIONS.

2–2. Loop Antenna ARC Type L-10A may be top- or bottom-mounted on the aircraft fuselage. However, because ground clearance is limited in most of the aircraft on which the L-10A will be installed, the top mounting is generally used. A location as near as possible to the center line of the aircraft, with adequate clearance both outside and inside the aircraft, should be selected. The antenna transmission line should be as short as possible, without sharp bends. Install the antenna so that the length of mechanical linkage required is kept to a minimum, but without any bend-radius of less than 5 inches, or any twisting of the casing. If necessary, use right-angle coupling ARC-6357 to obtain a "straight" connection. Check the dimensions of the installation area being considered with the installation dimensions required, as shown in figure 2–1. Installation dimensions for the C-18 control unit, and for the M-18 mounting which it requires for installation, are shown in figure 2–2.

2–3. INSTALLATION PROCEDURE.

2–4. To install the L-10A loop antenna, proceed as follows:

Step 1. Install a stiffening doubler on the skin of the aircraft (see figure 2–1).

Step 2. Using the template supplied with each L-10A (see figure 2–3), locate and drill the specified holes.

Step 3. Disassemble the loop ring from the gear box and casting by removing the three fillister-head screws from the ring base, and withdraw the loop ring. The round, knurled nut which secures the gear box to the casting should also be removed.

Step 4. Fasten the casting, with its apex pointing directly aft if possible, with the required number and length of No. 8-32 screws; use sealing compound and profile gaskets as required.

Step 5. Seal the screws with Glyptal, or equivalent sealing enamel.

Step 6. From the interior of the aircraft, insert the gear box through the skin of the aircraft, orienting it so that the guide pins fall into the slots provided in the casting. There are eight possible orientations. The orientation chosen should provide the most desirable routing of the mechanical linkage and coaxial cable.

Step 7. From the outside of the aircraft, attach the knurled nut and tighten securely.

Step 8. Seal the nut with Glyptal, or equivalent sealing enamel, for at least three-fourths of an inch of the circumference.

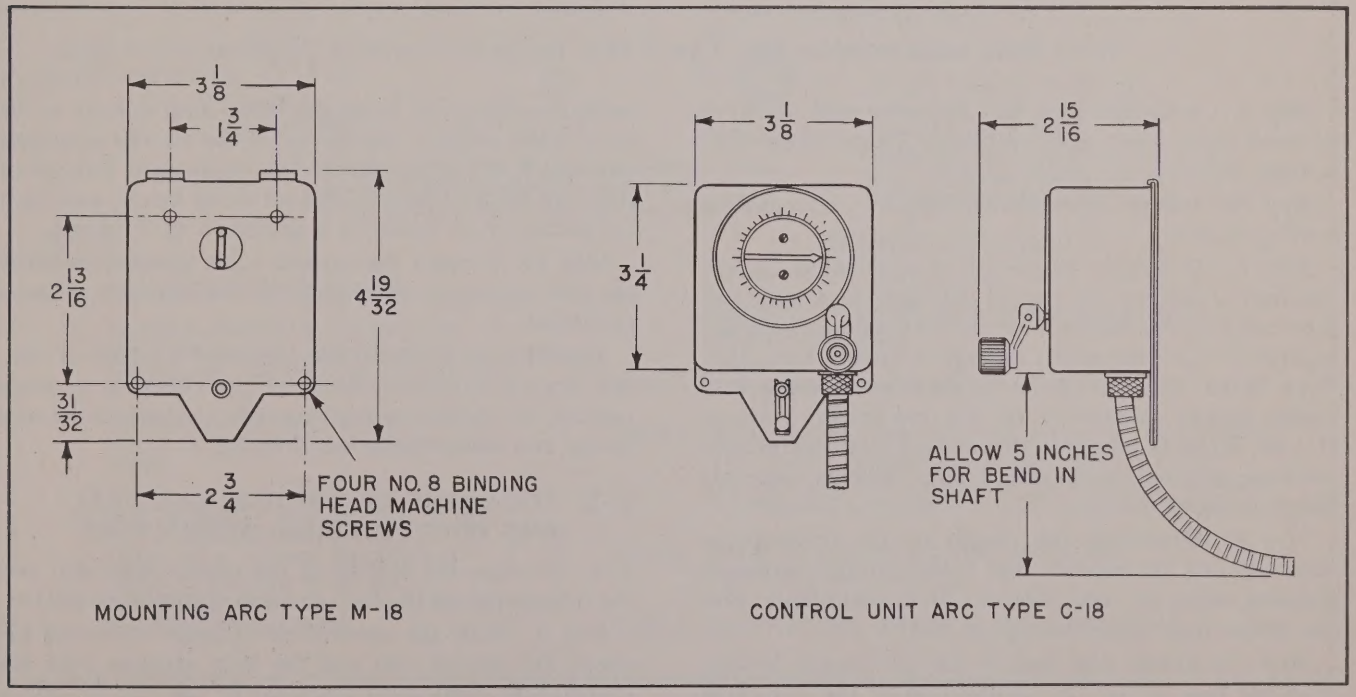


Figure 2–2. Control Unit ARC Type C-18 and Mounting ARC Type M-18, Installation Dimensions

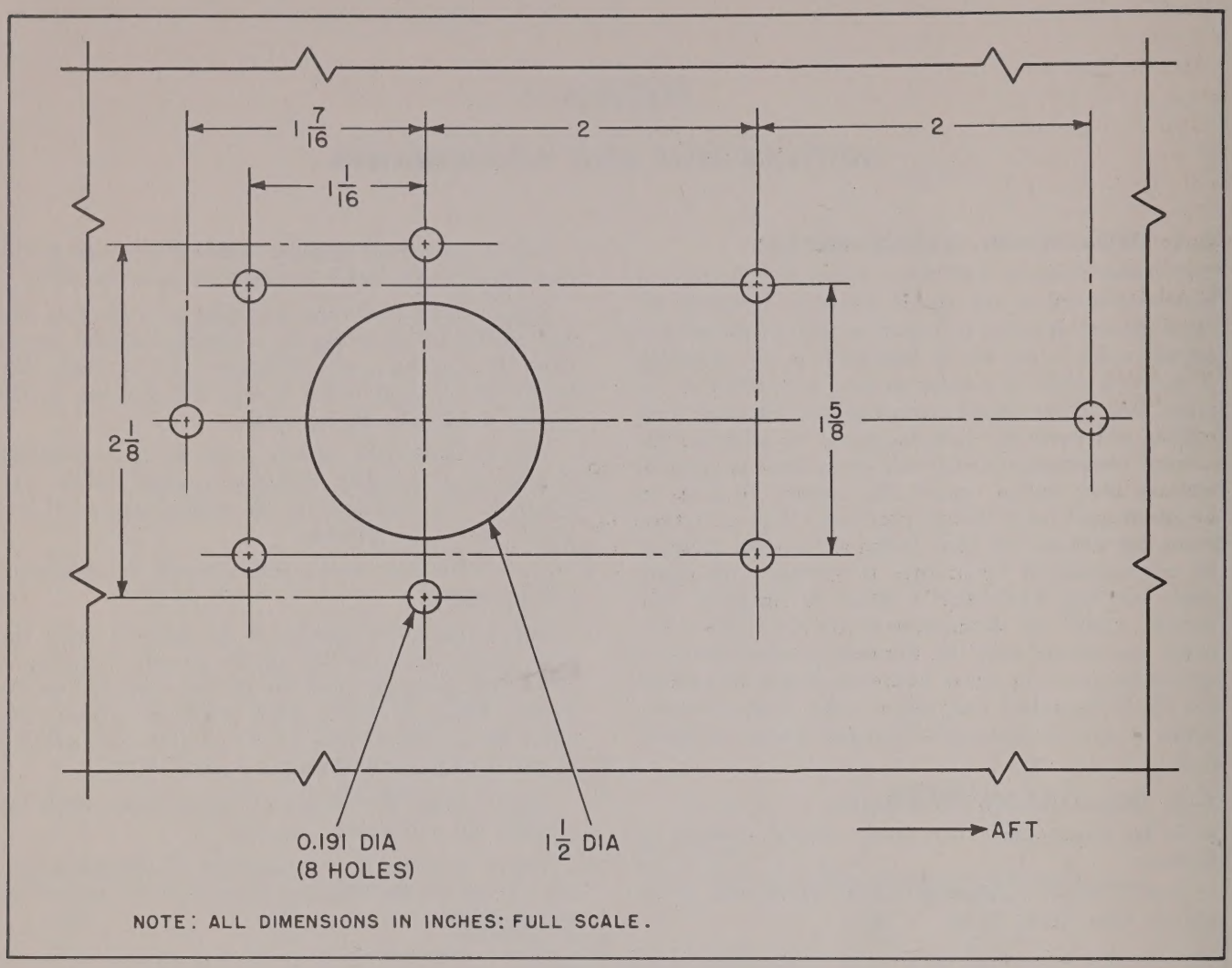


Figure 2–3. Loop Antenna ARC Type L-10A, Mounting Template Diagram

Step 9. Carefully insert the loop ring and fasten it in place with three cadmium-plated, fillister-head, steel screws.

Step 10. Seal the screws with Glyptal, or equivalent sealing enamel.

Step 11. Determine the length of mechanical linkage required to connect the control unit and the L-10A, and fabricate it in accordance with the instructions furnished separately with Mechanical Linkage Assembly Tool ARC Type W-10. The use of the W-10 is recommended to insure proper fabrication of the mechanical linkage. If tool W-10 is not available, follow the instructions outlined as part of the mechanical linkage assembly diagram, figure 2–4.

Step 12. Determine the length of the transmission line required to connect the L-10A to the receiver's antenna connector, and fabricate it in accordance with the instructions given in figure 2–5.

Step 13. Attach one end of the mechanical linkage to either the "T" or "B" termination of the loop gear box, depending upon whether the loop has been top- or bottom-mounted. Route the mechanical linkage in the most direct manner, depending on the aircraft structure, and attach the other end of the mechanical linkage to the C-18 Control unit. Avoid all sharp bends, and keep the radius of all bends to a minimum of 5 inches.

Step 14. Connect the antenna cable assembly between the loop antenna's connector and the receiver's antenna connector.

Step 15. Tie or clamp the cable and mechanical linkage, but be extremely careful of the clamping pressure exerted, to avoid compressing the mechanical linkage casing and cable insulation covering.

2–5. ALIGNMENT OF CONTROL UNIT DIAL AND LOOP ANTENNA ORIENTATION.

2–6. To align the setting of the control unit dial and the orientation of the loop antenna, proceed as follows:

Step 1. With the mechanical linkage connected between the control unit and the loop antenna, turn the control unit crank until the plane of the loop is exactly fore and aft.

Step 2. Disconnect the mechanical linkage at the control-unit end.

Step 3. Turn the control unit crank until the indicator dial is at "9" (90 degrees).

Step 4. Reconnect the mechanical linkage being careful not to change the relative position of the shafting or the spline to which it is attached.

Step 5. Check the rotation of the loop through 360 degrees. When the control unit dial is moving in a clockwise direction, the loop should also move clockwise, as viewed from the top of the aircraft, whether top- or bottom-mounted.

2–7. ADJUSTMENT OF RECEIVER "ALIGN INPUT" CONTROL.

2–8. Receivers ARC Type R-10A and ARC Type R-11A each provide a front-panel control to match the receiver's antenna circuit with the antenna in use. Adjust this input trimmer, marked "ALIGN INPUT," in the following manner:

Step 1. Set the receiver's control unit ANT.-LOOP switch to ANT.

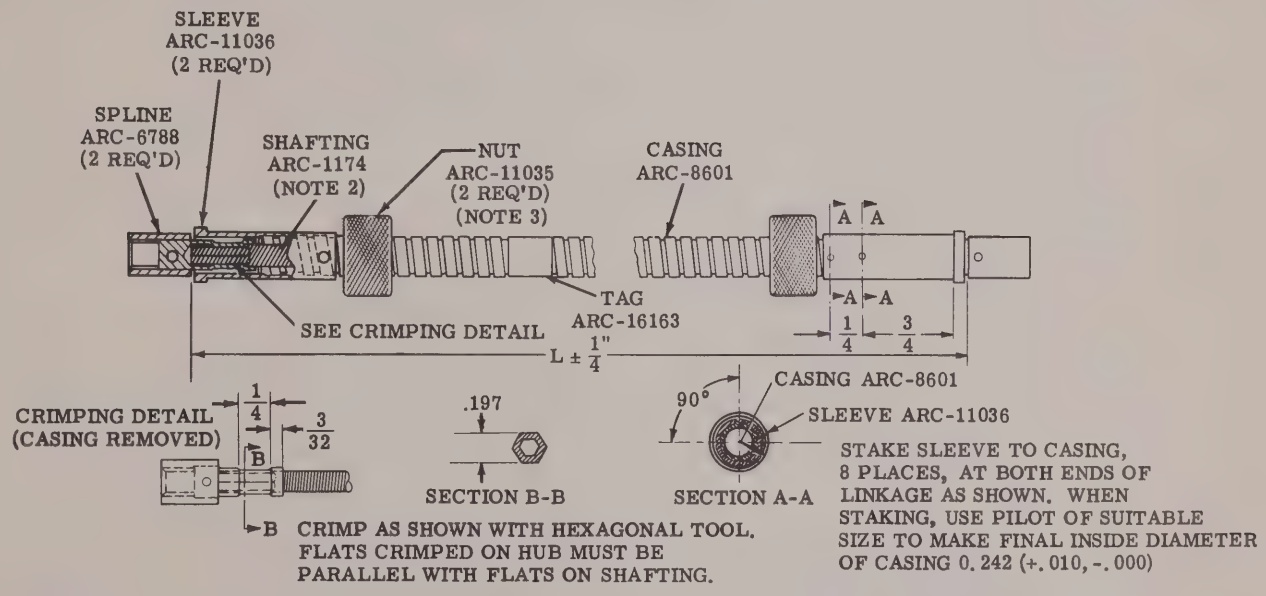
Step 2. Apply power to the receiver and set the receiver's sensitivity control to its maximum position.

Step 3. Tune the receiver to a point at the high-end of its frequency range where no signal is received.

Step 4. Adjust the receiver's ALIGN INPUT control for maximum background noise (maximum sensitivity). It is essential that this adjustment be made with the receiver tuned to the high-frequency end, because if performed at the low-frequency end, the adjustment will be so broad as to be inaccurate for the higher frequencies.

Step 5. Tune in several stations across the frequency range, adjusting the sensitivity control as required, to check the over-all sensitivity.

Step 6. Repeat Step 5 with the receiver's control unit ANT.-LOOP switch in the LOOP position; the previous setting of the ALIGN INPUT control should provide equivalent sensitivity for loop reception.


SLEEVE ARC-11036 (2 REQ'D)
SPLINE ARC-6788 (2 REQ'D)
SHAFTING ARC-1174 (NOTE 2)
NUT ARC-11035 (2 REQ'D) (NOTE 3)
CASING ARC-8601
TAG ARC-16163
SEE CRIMPING DETAIL
L ± 1/4"
CRIMPING DETAIL (CASING REMOVED)
SECTION B-B
SECTION A-A
CASING ARC-8601
SLEEVE ARC-11036
STAKE SLEEVE TO CASING, 8 PLACES, AT BOTH ENDS OF LINKAGE AS SHOWN. WHEN STAKING, USE PILOT OF SUITABLE SIZE TO MAKE FINAL INSIDE DIAMETER OF CASING 0.242 (+.010, -.000)
B CRIMP AS SHOWN WITH HEXAGONAL TOOL. FLATS CRIMPED ON HUB MUST BE PARALLEL WITH FLATS ON SHAFTING.

NOTES:

1. ALL DIMENSIONS IN INCHES.
2. BEFORE ASSEMBLY, LUBRICATE SHAFTING WITH A SLIGHT AMOUNT OF ESSO "UNIVIS NO. 40" OIL, OR EQUIVALENT.
3. BEFORE ASSEMBLY, APPLY ANTI-SEIZE LUBRICANT TO THREADS OF NUTS.
4. FOR ASSEMBLY PROCEDURE, IF ARC TYPE W-10 ASSEMBLY TOOL IS AVAILABLE, REFER TO INSTRUCTIONS FURNISHED WITH TOOL; OTHERWISE, USE PROCEDURE NOTED ON THIS ILLUSTRATION.

ASSEMBLY PROCEDURE

NOTE
USE ONLY IF ARC TYPE W-10 ASSEMBLY TOOL IS NOT AVAILABLE

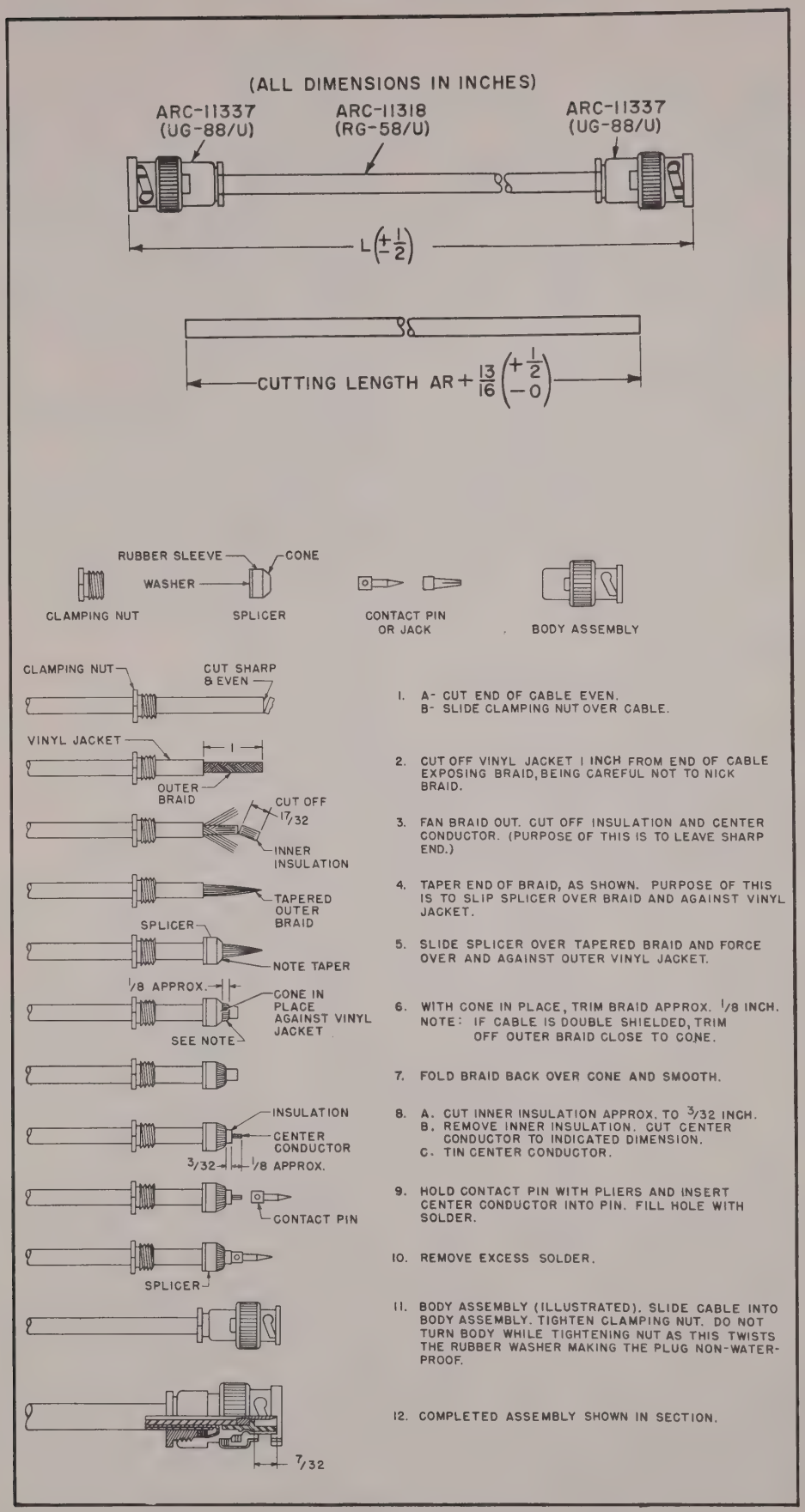
STEP 1. CUT SHAFTING TO REQUIRED LENGTH "L."

STEP 2. WITH CASING STRETCHED BY A FORCE OF 15 POUNDS, CUT CASING LONGER THAN SHAFTING BY 1/4 OF AN INCH PER FOOT, LESS 1 INCH. PUSH BACK CASING AS REQUIRED TO ASSEMBLE SPLINES ON SHAFTING.

STEP 3. STAKE CASING TO SLEEVE. REFER TO "SECTION A-A" DETAIL.

STEP 4. CRIMP SPLINE. REFER TO CRIMPING DETAIL.

Figure 2–4. Mechanical Linkage ARC-16158, Assembly Diagram



1. A- CUT END OF CABLE EVEN.
   B- SLIDE CLAMPING NUT OVER CABLE.
2. CUT OFF VINYL JACKET 1 INCH FROM END OF CABLE EXPOSING BRAID, BEING CAREFUL NOT TO NICK BRAID.
3. FAN BRAID OUT. CUT OFF INSULATION AND CENTER CONDUCTOR. (PURPOSE OF THIS IS TO LEAVE SHARP END.)
4. TAPER END OF BRAID, AS SHOWN. PURPOSE OF THIS IS TO SLIP SPLICER OVER BRAID AND AGAINST VINYL JACKET.
5. SLIDE SPLICER OVER TAPERED BRAID AND FORCE OVER AND AGAINST OUTER VINYL JACKET.
6. WITH CONE IN PLACE, TRIM BRAID APPROX. 1/8 INCH.
   NOTE: IF CABLE IS DOUBLE SHIELDED, TRIM OFF OUTER BRAID CLOSE TO CONE.
7. FOLD BRAID BACK OVER CONE AND SMOOTH.
8. A. CUT INNER INSULATION APPROX. TO 3/32 INCH.
   B. REMOVE INNER INSULATION. CUT CENTER CONDUCTOR TO INDICATED DIMENSION.
   C. TIN CENTER CONDUCTOR.
9. HOLD CONTACT PIN WITH PLIERS AND INSERT CENTER CONDUCTOR INTO PIN. FILL HOLE WITH SOLDER.
10. REMOVE EXCESS SOLDER.
11. BODY ASSEMBLY (ILLUSTRATED). SLIDE CABLE INTO BODY ASSEMBLY. TIGHTEN CLAMPING NUT. DO NOT TURN BODY WHILE TIGHTENING NUT AS THIS TWISTS THE RUBBER WASHER MAKING THE PLUG NON-WATER-PROOF.
12. COMPLETED ASSEMBLY SHOWN IN SECTION.

Figure 2–5. Antenna Cable Fabrication Diagram

SECTION III

OPERATION

3–1. OPERATION OF RECEIVER WITH L-10A LOOP ANTENNA.

3–2. To operate a receiver, such as ARC's Type R-10A or R-11A, using the L-10A loop antenna for homing or direction-finding, proceed as follows:

Step 1. Apply power to the receiver and tune the receiver to a station with the receiver's control unit ANT.-LOOP switch in the ANT. position.

Step 2. Set the receiver's control unit ANT.-LOOP switch to the LOOP position.

CAUTION

If the radio installation includes more than one ANT.-LOOP switch, all others must be set to the ANT. position.

Step 3. Turn the loop antenna's control unit crank, and adjust the receiver's sensitivity control, for the sharpest, minimum signal; alternately rotate the loop antenna and adjust the sensitivity control until this sharp-minimum signal is obtained.

Step 4. Determine the station bearing from the reading of the loop antenna's control unit dial; this is the bearing of the station from the heading of the aircraft.

CAUTION

Two minima signals, 180 degrees apart, will be found. This ambiguity is resolved by knowing the general location of the aircraft with respect to the station. If unknown, use either Method 1, described in paragraph 3–4, or Method 2, described in paragraph 3–6, to eliminate this ambiguity.

3–3. DETERMINATION OF STATION BEARING, METHOD 1.

3–4. The following procedure is one method of determining the general location of an aircraft with respect to a station, during loop-antenna operation.

Step 1. With the receiver tuned to the station, and the loop antenna positioned for a minimum signal, adjust the receiver's sensitivity for a minimum audible signal.

Step 2. Fly the airplane so that it is heading either toward or away from the station. The actual direction is determined as follows: If the signal increases, the aircraft is headed toward the station; if the signal decreases or disappears, the aircraft is headed away from the station.

3–5. DETERMINATION OF STATION BEARING, METHOD 2.

3–6. An alternative method, to that described in paragraph 3–4, for determining the location of a station with respect to an aircraft, during loop-antenna operation, requires an accurate determination of the null and a simultaneous reading of the gyro compass. This is followed by a flight of approximately five minutes duration, at 90 degrees to the compass reading, and a remeasurement of the bearing by reference to the gyro. An example follows:

Step 1. With the receiver tuned to the station, turn the loop antenna's control unit crank for an "O" reading on the dial.

Step 2. Head the aircraft into a null signal and note the gyro reading; call this reading "G_1."

Step 3. Fly a heading G_1 plus 90 degrees for approximately five minutes.

Step 4. Turning back toward the G_1 reading, head the airplane into a null signal and note the gyro reading; call this reading "G_2."

Step 5. Determine the position-relation of the station and the aircraft as follows: If G_2 is less than G_1, the heading G_1 is toward the station. If G_2 is greater than G_1, the heading G_1 is away from the station.

SECTION IV

MAINTENANCE

4–1. GENERAL.

4–2. This section provides maintenance information for Loop Antenna ARC Type L-10A insofar as disassembly for replacement of certain detail parts is concerned. Repair of the individual parts is not practical.

4–3. DISASSEMBLY OF L-10A LOOP ANTENNA.

4–4. An exploded view of the L-10A loop antenna, illustrating those parts which are considered replaceable, is shown in figure 4–1. The Aircraft Radio Corporation part numbers are included in the key on figure 4–1. To disassemble the L-10A, proceed as follows:

Step 1. Remove the three screws (2, figure 4–1) and remove the loop (1).

Step 2. Remove the nut (3) and mounting (4).

Step 3. Detach the baseplate (6) from the gearing box assembly (5) by removing the six screws (7) and washers (8).

Step 4. Unsolder the wire from the connector (9) and free the connector by removing the four screws (10) and washers (11).

Step 5. Remove the cap (12). With a center punch, or other suitable tool, remove the four grooved pins (14); then remove the two nuts (15) and slide them up the splines. Remove the two sleeves (13).

Step 6. Remove the screw (17) and washer (18) to free the contact assembly (16), and washer (19). Remove the screw (21) and washer (22) to free the insulator (20) and additional washer (19).

Step 7. Free the contact assembly (23) by removing the screw (24) and washer (25).

Step 8. Drive the two grooved pins (27) out of the nut (26), loosen the three setscrews (28) and remove the nut (26).

Step 9. Withdraw the spindle assembly (29).

Step 10. To dismount the worm assembly (30), remove the two grooved pins (31), screws (32), and washers (33).

Step 11. The nameplate (34) is attached to the box (36) with two rivets (35).

4–5. INSPECTION AND MINOR REPAIR OF PARTS.

4–6. After disassembly (refer to paragraph 4–4), inspect the L-10A parts for possible faults. Check that the taped joint at the top of the loop is not frayed or open. To reseal, use clear, nitrate dope, similar to Air Associates No. 101A, and apply two coats of dope to the outside of the tape. Inspect the spindle and worm assemblies for possible broken or chipped gear teeth. The contact assembly must be free of dirt or corrosion. Clean the contacts with a clean, lintless cloth dipped in carbon tetrachloride, or similar solvent. Further repair of the L-10A parts is not practical, and therefore if defective should be replaced.

4–7. REASSEMBLY OF L-10A LOOP ANTENNA.

4–8. To reassemble the L-10A loop antenna, proceed as follows:

Step 1. Mount the spindle (29, figure 4–1) into the box (36) and secure it in position with the nut (26). Replace the two grooved pins (27) and three setscrews (28) in the nut. Tighten the setscrews.

Step 2. Place the nuts (15) loosely over the splines of the worm assembly (30). Mount the worm assembly and secure it with the two screws (32) and washers (33); the splines must be centered in the sleeve openings.

Step 3. Adjust the position of the spindle and the worm gear for minimum backlash, without any evidence of binding over a 300-degree rotation of the worm gear.

Step 4. If the worm assembly (30) installed is not a replacement, press in the grooved pins (31). If a new worm assembly (30) has been used, drill two holes, 0.0625 inch diameter by 0.2187 inch deep, into the worm assembly, using the holes in the box (36) as guides. Press the grooved pins (31) into the holes.

Step 5. Replace the contact assembly (23) and secure it with the washer (25) and screw (24).

Step 6. Replace the washer (19) and insulator (20) and secure it with the washer (22) and screw (21). Replace the additional washer (19) and contact assembly (16) and secure with washer (18) and screw (17).

Index No.	*Part Name*	*ARC Part No.*
1	Loop	16161
2	Screw	8608
3	Nut	12823
4	Mounting	12848
5	Gearing Box Assembly	16156
6	Base Plate	12808
7	Screw	113(1/4)
8	Washer	4558
9	Connector, receptacle	11338
10	Screw	8264
11	Washer	4558
12	Cap	9808
13	Sleeve	6397
14	Grooved pin	213(1/4)
15	Nut	1285
16	Contact Assembly	16095
17	Screw	103(7/16)
18	Washer	10353
19	Washer	12924
20	Insulator	9368
21	Screw	103(1/4)
22	Washer	4558
23	Contact Assembly	16094
24	Screw	106(1/4)
25	Washer	4211
26	Nut	12826
27	Grooved pin	215(1/4)
28	Setscrew	4139
29	Spindle Assembly	12810
30	Worm Assembly	16188
31	Grooved pin	214(1/4)
32	Screw	106(3/8)
33	Washer	4211
34	Nameplate	16162
35	Rivet	234(1/8)
36	Box	16194

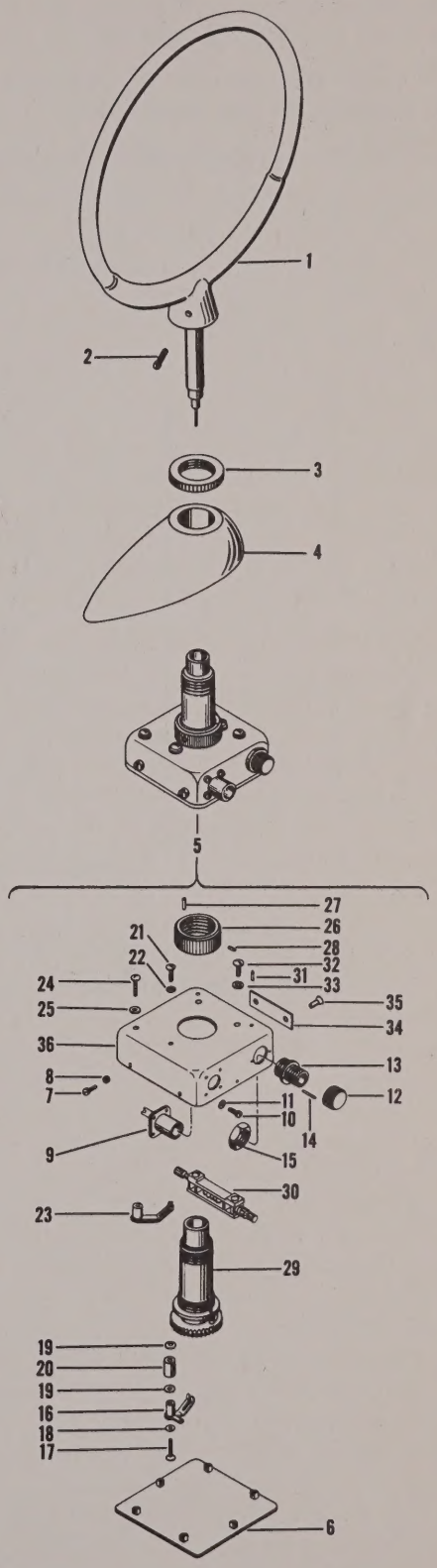


Figure 4—1. Loop Antenna ARC Type L-10A, Exploded View

Step 7. Align the contact assemblies as shown in figure 4–2.

Step 8. Mount the sleeves (13) with nuts (15). Press in the grooved pins (14). Replace the cap (12).

Step 9. Install the connector (9) and secure it with the four washers (11) and screws (10).

Step 10. Solder a required length of No. 22 bare wire between the terminal of connector (9) and the terminal lug of contact assembly (16).

Step 11. Replace the base plate (6) and secure it with the six washers (8) and screws (7).

Step 12. Replace the mounting (4) and lock it in position with the nut (3).

Step 13. Install the loop (1) and secure it in position with the three screws (2).

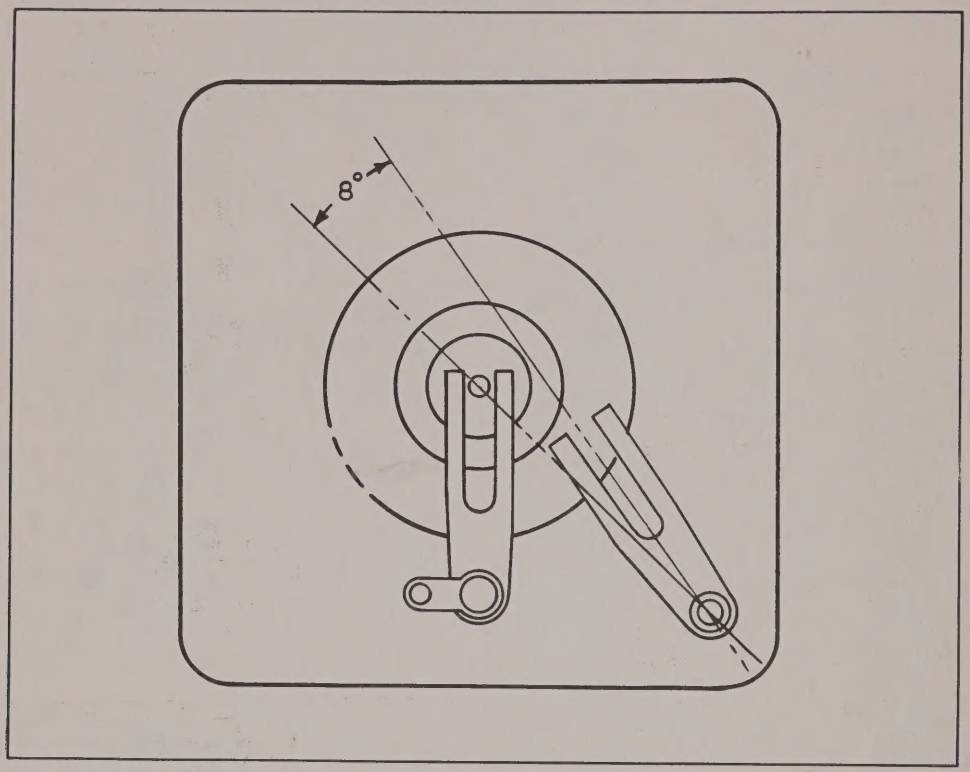


Figure 4–2. Alignment of Contact Assemblies of Loop Antenna ARC Type L-10A

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